Abstract

One challenge to the more widespread development of brackish groundwater in Texas is the lack of detailed information on brackish aquifers. In 2003, the Texas Water Development Board (TWDB) funded a study to determine brackish groundwater volumes in the state's 30 aquifers. The study estimated that Texas has approximately 2.7 billion acre-feet of brackish groundwater. However, the study was by design regional in scope, limited in areal extent, and narrow in its assessment of groundwater quality. In 2009, the 81st Texas Legislature approved funding to implement a program (now called the Brackish Resources Aquifers Characterization System or BRACS) to more thoroughly characterize the brackish aquifers in the state with the goal of assisting communities interested in exploring desalination as a water supply option. Since its inception, BRACS has built a formidable knowledge base of data on brackish groundwater resources in the state by analyzing and interpreting existing and available geophysical well logs and aquifer data. This data is managed in databases and geographic information systems (GIS). To date, the BRACS team has completed in-house studies for the Pecos Valley Aquifer, portions of the Gulf Coast Aquifer in the Lower Rio Grande Valley, and the Queen City and Sparta aquifers in Atascosa and McMullen counties and all study data are available on the TWDB website at http://www.twdb.texas.gov/innovativewater/bracs/index.asp. Ongoing in-house BRACS studies include the central region of the Upper Coastal Plains and Lipan aquifers, both of which will be completed in fall 2016. More recently, House Bill 30, passed by the 84th Texas Legislature in 2015 requires TWDB to identify, delineate, and report on brackish groundwater production zones in four aquifers (Blaine, Rustler, parts of the Carrizo-Wilcox, and Gulf Coast aquifers) by December 1, 2016. The Trinity, Blossom, and Nacatoch aquifers will have areas of potential brackish groundwater production delineated in fall 2017 and the remaining aquifers in the state before December 1, 2022.

Reference Cited


Website Cited

The following presentation is based upon professional research and analysis within the scope of the Texas Water Development Board’s statutory responsibilities and priorities but, unless specifically noted, does not necessarily reflect official Board positions or decisions.
Primary Responsibilities:

- State Water Plan
- Funding
- Water Resource Data
- Outreach

“To provide leadership, information, education, and support for planning, financial assistance, and outreach for the conservation and responsible development of water for Texas”
Projected Water Demands and Existing Supplies

![Graph showing projected water demands and existing water supplies from 2010 to 2060. The graph displays the volume in millions of acre-feet for each year, with projected demands increasing and existing supplies decreasing.]
Recommended Water Management Strategies by 2060

- Reuse, 9.9%
- Groundwater, 8.7%
- Municipal Conservation, 7.3%
- Groundwater Desalination, 2.0%
- Conjunctive Use, 1.5%
- Seawater Desalination, 2.7%
- Aquifer Storage and Recovery, 0.9%
- Other Conservation, 0.3%
- Brush Control, 0.2%
- Weather Modification, 0.2%
- Surface Water Desalination, <0.1%
- New Major Reservoir, 17.2%
- Irrigation Conservation, 16.3%
- Other Surface Water, 33.0%

Amended 2012 State Water Plan
Innovative Water Technologies

“Our mission is to educate the water community on the use of nontraditional water supplies.”

- Aquifer Storage & Recovery (ASR)
- Desalination
- Water Reuse
- Rainwater Harvesting
- Brackish Resources Aquifer Characterization System (BRACS)
Brackish Resources Aquifer Characterization System

- Collect data
- Map and characterize aquifers
- Map key water quality parameters
- Estimate saturated zones using net sand analysis
- Chemical parameters important to desalination
- Provide data to stakeholders
# Brackish Groundwater

Saltier than fresh water, less salty than seawater

<table>
<thead>
<tr>
<th>Groundwater Salinity Classification</th>
<th>Salinity Zone Code</th>
<th>Total Dissolved Solids Concentration (units: milligrams per liter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fresh</td>
<td>FR</td>
<td>0 to 1,000</td>
</tr>
<tr>
<td>Slightly Saline</td>
<td>SS</td>
<td>1,000 to 3,000</td>
</tr>
<tr>
<td>Moderately Saline</td>
<td>MS</td>
<td>3,000 to 10,000</td>
</tr>
<tr>
<td>Very Saline</td>
<td>VS</td>
<td>10,000 to 35,000</td>
</tr>
<tr>
<td>Brine</td>
<td>BR</td>
<td>Greater than 35,000</td>
</tr>
</tbody>
</table>

Modified from Winslow and Kister, 1956
Obtain oil, gas, and water well logs

Scan into digital TIFF image files

Logs must be non-confidential

Entire collection available to the public

Total BRACS well control > 53,000 wells
Digital geophysical and water well logs
Log analysis to interpret Total Dissolved Solids

At 160 ft = 15 ohm-meter

$R_{wa}$ Minimum Method interpreted TDS = 2,500 mg/L

Water Well
TDS concentration = 2,264 mg/L
(well screen 170-349 ft)

BRACS Well ID 42889

Source: Lower Rio Grande Valley BRACS Study
BRACS Database, Navigation to Forms

1: Select a form to display

- BRACS Database Master Well Form
    - Pecos Valley Aquifer Study: Aquifer Determination Form
    - Pecos Valley Aquifer Study: Net Sand Form
  - TWDB Technical Note 14-01, 2014, Queen City and Sparta Aquifers, Atascosa and McMullen Counties, Texas: Structure and Brackish Groundwater
    - Queen City and Sparta Aquifer Study: Aquifer Determination Form
    - Queen City and Sparta Aquifer Study: Net Sand Form
    - Gulf Coast CCASRCD Study: Aquifer Determination Form
    - Gulf Coast CCASRCD Study: Net Sand Form
    - Gulf Coast Lower Rio Grande Valley Study: Aquifer Determination Form
    - Gulf Coast Lower Rio Grande Valley Study: Net Sand Form
    - Gulf Coast Lower Rio Grande Valley Study: Salinity Zone Form

2: Press Button

Open Form

BRACS Database Tables

- Microsoft Access Database
- Available on the TWDB web site (with data dictionary)
- Relational table design
- All wells are assigned a unique well id, linking (red line) records together
BRACS Supporting Databases

Texas Water Development Board (TWDB):
BRACS Database

- TWDB: Groundwater, Desalination, Aquifer Storage & Recovery Databases
- Rail Road Commission: Oil & Gas Well, Q Log, and Class II Injection Well Databases
- U.S. Geological Survey: Water Well and Produced Water Data
- Texas Commission on Environmental Quality: Public Water Systems Database
- Texas Bureau of Economic Geology: Integrate Core and Log Database
- University Lands: Oil & Gas Well Database
- Groundwater Conservation Districts: Water Well Data
- Texas Department on Licensing and Regulation: Water Well Report Database
- New Mexico: Oil & Gas and Water Well Databases
- Public Water Service Systems: Water Well Data

BRACS: Beneath the Surface for Sustainable Watershed Management
Groundwater Data Viewer
This interactive mapping application provides access to water-related data for Texas. The viewer contains several GIS datasets relating to water resources, including TWDB groundwater data, brackish groundwater data, and data. 
click to show more

Major Aquifer 3D Viewer
A three dimensional interactive viewer for exploring the major aquifers of Texas. After choosing an aquifer, users can choose to be re-directed to a 3D viewer that allows visual manipulation of the subsurface model. The 
click to show more

2012 State Water Plan
This application displays water planning information on which the 2012 State Water Plan is based. Each water user group is mapped to a single point near its primary location; therefore, an entity with a large or multiple 
click to show more

Water Data for Texas
This website is a product of the Texas Water Development Board (TWDB) Water Science Conservation Division and is made possible by the support of management and staff at TWDB. This project is part of our ongoing efforts to 
click to show more
Groundwater Data Viewer
Groundwater Data Viewer

Well Id: 19757 - Logs
Geophysical Well Logs for Well Id: 19757

Log Id: 20867
File Type: tif
File Size: 4 MB

For Geophysical Well Log assistance contact:
DRACS@twdb.texas.gov

Data Source: BEG Paper/Digital
API Number: 4244101287
County: Taylor
Well Depth (ft): 3553
Total Depth (ft): 12/03/1949
BRACS Data

• GIS data
  • Locate geophysical well logs
  • Lateral extent of brackish aquifers
    • Stratigraphy and Lithology Interpolation
  • Water quality parameters
  • Saturated Zones
• Rasters and shapefiles
• Available for download online
BRACS Studies

- Published reports
- GIS Datasets
- BRACS Database
- Well logs

The real value is in the data:
Stakeholders can use this to evaluate potential groundwater exploration areas.

http://www.twdb.texas.gov/innovativewater/bracs/docs.asp
BRACS Website for Database

Texas Water Development Board

BRACS Database

The Brackish Resources Aquifer Characterization System (BRACS) Database was designed to store well and geology information in support of projects to characterize the brackish groundwater resources of Texas. The BRACS database is fully relational, with self-documenting object naming. The database design relies on extensive use of lookup tables. The BRACS database is a Microsoft Access 2007 format that has been compressed with the WinZip utility. This database will be updated periodically; the date of the last update is embedded in the filename.

This database was developed for use by TWDB staff in support of the BRACS program. The information changes on a daily basis and users should note the following disclaimer regarding the information:

Except where noted, all of the information provided is believed to be accurate and reliable; however, TWDB assumes no responsibility for any errors. Further, TWDB assumes no responsibility for the use of the information provided. PLEASE NOTE that users of these data are responsible for checking the accuracy, completeness, currency and/or suitability of all information themselves. TWDB makes no guarantees or warranties as to the accuracy, completeness, currency, or suitability of the information provided via the BRACS Database. TWDB specifically disclaims any and all liability for any claims or damages that may result from providing BRACS data or the information it contains. Well data and interpretations will be posted during the course of a BRACS study, however data is subject to change prior to publication of the study.

A data dictionary to accompany the BRACS Database is now available for download. The dictionary describes each primary table in the database and custom tables developed for a study.


If you have any questions about the database, please contact John Meyer at 512-463-8010.
Study Reports and GIS Data

**BRACS Studies**

- Current Studies
- Completed Studies

### Current Studies

<table>
<thead>
<tr>
<th>Project</th>
<th>Start Date</th>
<th>End Date</th>
<th>Total Cost</th>
<th>Keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wikoo, Canas, Queen City, Sparta, and Vega Aquifers, Central Texas: Strata and Brackish Groundwater</td>
<td>Spring 2013</td>
<td>August 2016</td>
<td>In-house</td>
<td>Brackish, Groundwater, Aquifers</td>
</tr>
</tbody>
</table>

### Completed Studies

<table>
<thead>
<tr>
<th>Complete Date</th>
<th>Project</th>
<th>Report Number</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/2014</td>
<td>Brackish Groundwater in the Gulf Coast Aquifer, Lower Rio Grande Valley, Texas</td>
<td>383</td>
<td>In-house</td>
</tr>
<tr>
<td></td>
<td>Gulf Coast Aquifer GIS Datasets (127.0 MB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>05/2014</td>
<td>Queen City and Sparta Aquifers</td>
<td>14-01</td>
<td>In-house</td>
</tr>
</tbody>
</table>
Development of Brackish Groundwater
House Bill 30 (84th Texas Legislature, 2015)

• $2,000,000 appropriated from General Revenue Fund

• Note that $1,681,446 was dedicated to funding the BRACS studies. The remainder paid for two FTE.

• Four aquifer projects must be completed by December 1, 2016

• Three other contracted projects - must be completed by August 31, 2017

• Map brackish groundwater production zones and estimate 30- and 50-year production without causing significant impact to water quality or water quantity in freshwater aquifers

• Include status report in every biennial desalination report, next report due December 1, 2016 (Water Code Sec. 16.060)

• Remaining aquifers in the state required to be mapped by December 1, 2022
BRACS Program

Brackish Resources Aquifer Characterization System

Current Studies
1. Aquifers of the upper coastal plain - Central
2. Lipan Aquifer

Completed Studies
A. Pecos Valley Aquifer (Report 382)
B. Gulf Coast Aquifer (Corpus Christi) (Report 12-01)
C. Gulf Coast Aquifer (Lower Rio Grande Valley) (Report 383)
D. Queen City-Sparta aquifers (Report 14-01)

House Bill 30 Projects
2016 Aquifers
- Be. Blaine
- Cz. Carrizo
- Gc. Gulf Coast
- Rr. Rustler

2017 Aquifers
- Bm. Blossom
- Nh. Nacatoch
- Ty. Trinity

Proposed studies are conceptual and may or may not represent a precise location and extent or actual implementation. http://www.twdb.texas.gov/mis/valleywater/bracs/index.asp

This map was generated by the Texas Water Development Board using GIS (Geographical Information System) software. No claims are made to the accuracy or completeness of the information shown herein or to its suitability for a particular use. The scale and location of all mapped data are approximate.
We appreciate data!

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(512) 463-2865
http://www.twdb.texas.gov/innovativewater/index.asp
Draft 2017 Water Plan:
https://2017.texasstatewaterplan.org/statewide